Remarks

I. Introduction

This is in response to the Office Action dated December 2, 2006. The Office Action objected to the Drawings.

The Office Action rejected claims 1-15 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-7 and 11-20 of U.S. Patent No. 6,519,705 (Leung).

The Office Action rejected claims 1, 4, and 5 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,374,117 to Denkert et al. (Denkert) in view of U.S. Patent No. 6,760,313 to Sindhushayana et al. (Sindhushayana). The Office Action rejected claim 2 as being unpatentable over Denkert and Sindhushayana in further view of U.S. Patent No. 6,690,944 to Lee et al. (Lee). The Office Action rejected claims 3 and 11 as being unpatentable over Denkert and Sindhushayana in further view of U.S. Patent No. 6,282,209 to Kataoka et al. (Kataoka). The Office Action rejected claim 6 as being unpatentable over Denkert and Sindhushayana in further view of U.S. Publication No. 2003/0039237 (Forslow). The Office Action rejected claim 7 as being unpatentable over Denkert and Sindhushayana in further view of U.S. Patent No. 5,901,186 to Jamal et al. (Jamal). The Office Action rejected claim 8 as being unpatentable over Denkert and Sindhushayana in further view of U.S. Patent No. 6,122,293 to Frodigh et al. (Frodigh). The Office Action rejected claim 9 as being unpatentable over Denkert and Sindhushayana in further view of U.S. Patent No. 6,408,165 to Rassinia et al. (Rassinia). The Office Action rejected claims 10, 13 and 15 as being unpatentable over Denkert, Sindhushayana and Lee in further view of U.S. Patent No. 5,551,057 to Mitra (Mitra) and U.S. Patent No. 6,526,260 to Hick et al. (Hick). The Office Action rejected claim 12 as being unpatentable over Denkert and Sindhushayana in further view of U.S. Patent No. 6,856,812 to Budka et al. (Budka). The Office Action rejected claim 14 as being unpatentable

over Denkert, Sindhushayana, Lee, Mitra and Hick in further view of U.S. Patent No. 6,952,181 to Karr et al. (Karr).

The Office Action also objected to claims 11, 13, and 15 because of informalities.

In response, Applicants have amended claims 1, 11, 13, and 15. Claims 2, 10, and 14 have been cancelled. Claims 1, 3-9, 11-13 and 15 remain for consideration. In response to the objection to the drawings, formal drawings are being submitted with this Amendment.

II. Double Patenting Rejection

Applicants do not admit that the claims of Leung are not patentably distinct from the claims of the present invention. However, in order to expedite prosecution, Applicants are hereby filing a terminal disclaimer under 37 C.F.R. §1.321(c). Withdrawal of the double patenting rejection is respectfully requested.

III. Rejections under 35 U.S.C. §103(a)

Independent claim 1 was rejected as being unpatentable over Denkert in view of Sindhushayana. In order to "establish *prima facie* obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art." In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Furthermore, "all words in a claim must be considered in judging the patentability of that claim against the prior art." In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). See also MPEP § 2143.03. Neither of the cited references, either alone or in combination, teach all of the claim limitations of independent claim 1. Therefore, Applicants request the withdrawal of the rejection under 35 U.S.C. §103(a).

The present invention is generally directed to using link adaptation and power control for streaming service in a wireless packet network. In the present invention, link adaptation is utilized to target a predetermined error rate for transmission of data packets. Power control is utilized to reduce variations in the

predetermined error rate. The link adaptation adapts a modulation and coding level based on a relationship between a signal-to-inference-plus-noise ratio (SINR) and the predetermined error rate in order to achieve the predetermined error rate. The SINR is predicted from a signal path gain, a maximum transmission power level, and a predicted interference power level. Accordingly, the link adaptation uses an SINR predicted with an assumption of a maximum transmission power to adapt the modulation and coding level instead of basing the modulation and coding level on an actual transmission power used to transmit the data packets. The power control then adjusts the transmission power level based on the adapted modulation and coding level.

In the present invention, the power control adjusts the transmission power level according to the modulation and coding level set by the link adaptation. The link adaptation sets the modulation and coding level using the predicted SINR. However, the transmission power level is a factor used to predict the SINR. Therefore, the present invention assumes a maximum transmission power level to predict the SINR, uses the predicted SINR to perform link adaptation to adapt the modulation and coding level, and performs power control to adjust the power transmission level based on the adapted modulation and coding level.

These aspects of the present invention are included in amended independent claim 1. Independent claim 1, as amended, includes the limitations of dependent claims 2, 10, and 14. More particularly, independent claim 1 is amended to recite that the link adaptation technique to adapt a modulation and coding level to achieve a predetermined error rate for transmission of data packets is "based on a relationship between said error rate and a signal-to-interference-plus-noise ratio, wherein said signal-to-interference-plus-noise ratio is predicted from a signal path gain, a maximum transmission power level, and a predicted interference power level." Independent claim 1 has also been amended to recite that the power control technique to adjust a transmission

power to a level which provides desirable performance is "based on the adapted modulation and coding level."

Denkert is directed to controlling a transmit power level of packets based upon queue delay of the packets. In this method, packets which have experienced a lengthy queue delay are prioritized and transmitted at a higher transmit power. As described at column 6, lines 41-54, a link adaptation function can be used in conjunction with the control of the transmit power. However, the link adaptation function is used to provide a suitable modulation and/or coding scheme for the determined transmit power level. The transmit power control method of Denkert controls transmit power based on which packets have been prioritized, not based on a modulation and coding level set to achieve a predetermined error rate. Therefore, Denkert does not teach "utilizing a power control technique to adjust a transmission power to a level which provides desirable performance based on the adapted modulation and coding level," as presently recited in independent claim 1.

Furthermore, the link adaptation function of Denkert selects the modulation and coding to provide greater throughput for packets which have been prioritized to be transmitted with higher power levels. The link adaptation function does not adapt the modulation and coding to achieve a predetermined error rate. Although, as described at column 4, lines 50-58, the power control algorithm of Denkert can receive measurement data of bit error rate, Denkert does not describe using the link adaptation function to achieve a predetermined error rate. Also, the link adaptation uses the actual determined power level to set the modulation and coding, not a relationship between a predetermined error rate and an SINR. In fact, Denkert does not teach using an SINR in the link adaptation, let alone an SINR predicted from a signal path gain, a maximum transmission power level, and a predicted interference power level. Therefore, Denkert does not teach "utilizing a link adaptation technique to adapt a modulation and coding level to achieve a predetermined error rate for transmission of data packets based on a relationship between said error rate and

a signal-to-interference-plus-noise ratio, wherein said signal-to-interference-plus-noise ratio is predicted from a signal path gain, a maximum transmission power level, and a predicted interference power level," as presently recited in independent claim 1.

Sindhushayana does not disclose the missing limitations of independent claim 1. Sindhushayana is directed to selecting a transmission data rate to maintain a target packet error rate. The method of Sindhushayana varies the transmission data rate between a data transmission rate which has a packet error rate below the target packet error rate and a data transmission rate which has a packet error rate above the target packet error rate according to a calculated probability distribution. Although, Sindhushayana does describe targeting a specific packet error rate, the packet error rate is targeted by varying data transmission rates, not using link adaptation to adapt modulation and coding levels. Also, nowhere in Sindhushayana is a link adaptation technique based on a relationship between an SINR and a predetermined error rate. Although column 10, lines 59-62 describes establishing a relationship between an SINR and a packet error rate, this relationship is not used in a link adaptation technique and there is no suggestion that a link adaptation technique be based on this relationship. Furthermore, Sindhushayana the SINR is never described as being predicted from a signal path gain, a maximum transmission power level, and a predicted interference power level. Therefore, neither Sindhushayana nor Denkert teach "utilizing a link adaptation technique to adapt a modulation and coding level to achieve a predetermined error rate for transmission of data packets based on a relationship between said error rate and a signal-to-interference-plus-noise ratio, wherein said signal-to-interference-plus-noise ratio is predicted from a signal path gain, a maximum transmission power level, and a predicted interference power level," as presently recited in independent claim 1.

Sindhushayana fails to disclose any power control method, let alone a power control method based on a modulation and coding level adapted using a link adaptation technique. In fact, Sindhushayana states that "in a modern high

data rate (HDR) system, Access Point(s) (APs) always transmit at maximum power...." Therefore, neither Sindhushayana nor Denkert teach "utilizing a power control technique to adjust a transmission power from said maximum transmission power to a level corresponding to an SINR target associated with the adapted modulation and coding level," as presently recited in independent claim 1.

In the rejections of claims 10 and 14, the Office Action relies on Mitra as disclosing "a concept of using a signal path gain, a transmission power level and interference power level (col. 3, lines 15-31)," Hick as disclosing "a concept of using predicted interference power level (col. 2, lines 46-56)," and Karr as disclosing "a concept of using a maximum transmission power level." However the Office Action only refers to the usage of a signal gain path, a maximum transmission power level, predicted interference power level, and fails to address the limitation of the signal-to-interference-plus-noise ratio being predicted. Also the Office Action fails to address the link adaptation technique being based on the relationship between a predicted SINR and a predetermined error rate.

Mitra is directed to updating transmitting units. At column 3, lines 15-31, Mitra describes calculating a signal path gain and measuring co-channel interference power. The calculated signal path gain, the measured co-channel interference power, and a fixed value corresponding to a ratio of a carrier power to a co-channel interference power are used to calculate a value which is used to regulate the power of signals transmitted by the transmitting units. However, at no point does Mitra teach or suggest using the signal path gain, co-channel inference, and transmission power level to estimate an SINR, let alone use an estimated SINR in a link adaptation technique.

Hick is directed to a method of estimating the cross-channel interference level in a test channel in a multi-channel electrical system. As described at column 1, lines 13-15, cross channel interference is interference due to the intermodulation of signals carried by two or more channels. At column 2, lines

46-56, Hick describes predicting the intermodulation interference power level which will result from a given change in the power level of one or more of the channels contributing to the interference. However, Hick does not describe using the predicted intermodulation interference power level to predict an SINR. Furthermore, there is no motivation to combine the teachings of Hick with the teaching of Mitra because Mitra teaches using a co-channel interference power level and Hick teaches predicting a cross-channel interference power level. Co-channel interference refers to interference due to signals within a channel. Accordingly, it would not be obvious to one of ordinary skill in the art use a predicted cross-channel interference level in place a measured co-channel interference level.

Karr is directed to determining a location of a mobile station using various communication standards. At column 25, lines 25-37, Karr describes determining a maximum transmission power level of a mobile station and a standardized mobile station transmitter power level having a predetermined maximum power. However, there is nothing in Karr to suggest using a maximum transmission power level to estimate an SINR. It cannot be assumed that one of ordinary skill in the art would use a maximum transmission power to estimate an SINR solely because the maximum transmission power exists or can be determined.

Thus, for the reasons discussed above, independent claim 1 is allowable over Denkert, Sindhushayana, Lee, Mitra, Hick, and Karr, separately or in any combination thereof. All remaining claims are dependent upon an allowable independent claim and are therefore also allowable.

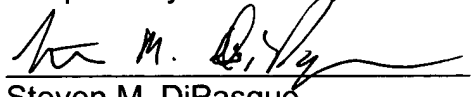
IV. No New Matter has Been Added

The amendments to claims 1, 11, 13, and 15 do not add new matter. Support for the claim amendments are shown in cancelled claims 2, 10, and 14, and in the Specification at least at page 6.

V. Conclusion

For the reasons discussed above, all pending claims are allowable over the cited art. Reconsideration and allowance of all claims is respectfully requested.

Respectfully submitted,



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